

## REMARKS

Claim 17 has been amended. Claims 1-4, 8, 9 and 12-18 remain for further consideration. No new matter has been added.

The objections and rejections shall be taken up in the order presented in the Official Action (hereinafter “Action”).

1. Claim 17 currently stands rejected under 35 U.S.C. §112, second paragraph, for allegedly being indefinite.

The Action contends that claim 17 is indefinite since “*it is unclear how a curved surface can be a ‘linear contact surface’, since a curve is not linear.*” (Action, pg 2). Applicants respectfully disagree with this contention. Specifically, linear may be defined as pertaining to or represented by a line(s). (see Dictionary.com, “linear”). As commonly known in the art, lines may be straight or curved. Therefore, the *linear contact surface* recited in claim 17 may be curved. As a result, applicants respectfully request that this rejection be withdrawn.

2. Claims 1-4, 8 and 12-18 currently stand rejected under 35 U.S.C. §102(b) for allegedly being anticipated by U.S. Patent No. 5,829,305 to Ham (hereinafter “Ham”).

### CLAIM 1

Claim 1 recites a worm gear mechanism for a power-assisted automobile steering mechanism. The worm gear mechanism includes:

*“a rotatable cylindrical worm having a plurality of worm teeth that rotate about a first axis, each of the plurality of worm teeth having a first tooth face which includes a first convex region and a first concave region; and*

*a rotatable cylindrical worm gear having a plurality of worm gear teeth that rotate about a second axis, each of the plurality of worm gear teeth having a*

second tooth face which includes a second concave region and a second convex region;

*where the first axis and the second axis are substantially perpendicular;*

*where the rotatable cylindrical worm and the rotatable cylindrical worm gear mesh together in a first configuration such that the first tooth face and the second tooth face define a linear contact along one of a plurality of portions of a linear contact region that extends between a base of the worm gear tooth and a tip of the worm gear tooth.*" (cl. 1, emphasis added).

The Action contends that Ham teaches each feature recited in claim 1. Applicants respectfully disagree.

In contrast to claim 1, Ham teaches, as illustrated in FIG. 2, that "*the plurality of teeth 16a-16f engage mating teeth, such as teeth 18c-18f, to rotatably drive gear 18 in response to driven rotation of shaft 22 by motor 14.... Notice also that teeth 16a-16f engage mating teeth 18c-18f at a plurality of contact points 33, 35, 37 and 39.*" (Ham, col. 3, lines 54-59, emphasis added). These point contacts are exemplified in FIGs. 1-6. For example, as illustrated in FIG. 2, Ham teaches that each tooth of the drive gear 16 has a curved tip, a curved base and **straight** sides. (see Ham, FIGs. 1-6). Thus, Ham teaches that the curved sides of the teeth from the driven gear 18 engage the straight sides of the teeth from the drive gear 16. As known in the art, this curved surface / straight surface type of contact forms a point contact. Therefore, Ham fails to teach or suggest the feature of "*where the rotatable cylindrical worm and the rotatable cylindrical worm gear mesh together in a first configuration such that the first tooth face and the second tooth face define a linear contact along one of a plurality of portions of a linear contact region that extends between a base of the worm gear tooth and a tip of the worm gear tooth.*" (cl. 1, emphasis added).

In addition, as set forth above, Ham teaches that the sides of the driven gear 18 engages the straight sides of the drive gear 16. Thus, according to a fair and proper reading of Ham, the

contact points are defined between the sides of the driven gear 18 and the straight sides of the drive gear 16. Therefore, Ham fails to teach or suggest the features of “*the first tooth face and the second tooth face define a linear contact*” where each of the plurality of worm teeth have “*a first tooth face which includes a first convex region and a first concave region”, and where each of the plurality of worm gear teeth have “*a second tooth face which includes a second concave region and a second convex region....*” (cl. 1, emphasis added).*

A 35 U.S.C. §102(b) rejection requires a single prior art reference disclose each feature of the claimed invention. As a result, it is respectfully submitted that Ham is incapable of anticipating claim 1.

#### **CLAIMS 2-4, 8 AND 12-14**

Applicants respectfully submit that these rejections are now moot since claim 1 is patentable for at least the reasons as set forth above.

#### **CLAIM 15**

Claim 15 recites a worm gear assembly. The assembly includes:

*“a worm with a plurality of worm teeth that rotate about a first axis; and  
a worm gear with a plurality of worm gear teeth that rotate about a  
second axis;*

*where each tooth of the worm and each tooth of the worm gear has a  
concave profile in a region near a base of the tooth and a convex profile in a  
region near a tip of the tooth;*

*where the worm and the worm gear mesh together in a first configuration  
such that one of the plurality of worm teeth and one of the plurality of worm gear  
teeth define a linear contact along one of a plurality of portions of a linear  
contact region extending between the base of the worm and the tip of the worm.”*  
(cl. 15, emphasis added).

In contrast, as set forth above, Ham teaches that each tooth of the drive gear 16 has a curved tip, a curved base and straight sides between the tip and the base. (see Ham, FIGs. 1-6). That is, Ham does not teach a concave profile in a region near the base. Thus, Ham fails to teach the feature of “*where each tooth of the worm and each tooth of the worm gear has a concave profile in a region near a base of the tooth and a convex profile in a region near a tip of the tooth....*” (cl. 15, emphasis added).

In addition, as set forth above, according to a fair and proper reading, Ham teaches that the sides of the teeth from the driven gear 18 engage the straight sides of the teeth from the drive gear 16. As known in the art, this curved surface / straight surface type of contact forms a **point** contact. Therefore, Ham fails to teach or suggest the feature of “*where the worm and the worm gear mesh together in a first configuration such that one of the plurality of worm teeth and one of the plurality of worm gear teeth define a linear contact along one of a plurality of portions of a linear contact region extending between the base of the worm and the tip of the worm*.” (cl. 15, emphasis added).

A 35 U.S.C. §102(b) rejection requires a single prior art reference disclose each feature of the claimed invention. As a result, it is respectfully submitted that Ham is incapable of anticipating claim 15.

## **CLAIM 16**

Applicants respectfully submit that this rejection is moot since claim 15 is patentable for at least the reasons as set forth above.

## CLAIM 17

Amended claim 17 recites a worm gear assembly. The assembly includes:

*“a first gear having a plurality of first teeth each having a first tooth face that rotate about a first axis, each of the first tooth faces having a first profile including a first and a second **linear contact surface**; and*

*a second gear having a plurality of second teeth each having a second tooth face that rotate about a second axis, each of the second tooth faces having a second profile including a third and a fourth **linear contact surface**;*

*where the first and the second gears mesh together such that the first linear contact surface of one of the plurality of the first teeth **linearly contacts** the third linear contact surface of one of the plurality of the second teeth along one of a plurality of portions of a linear contact region; and*

*where the first profile and the second profile extend the linear contact region radially through the first, the second, the third and the fourth linear contact surfaces.” (cl. 17, emphasis added).*

The Action contends that Ham teaches each feature recited in claim 17. Applicants respectfully disagree.

In contrast to claim 17, Ham teaches, as illustrated in FIG. 2, that “*the plurality of teeth 16a-16f engage mating teeth, such as teeth 18c-18f, to rotatably drive gear 18 in response to driven rotation of shaft 22 by motor 14.... Notice also that teeth 16a-16f engage mating teeth 18c-18f at a plurality of contact points 33, 35, 37 and 39.*” (Ham, col. 3, lines 54-59, emphasis added). These point contacts are exemplified in FIGs. 1-6. Thus, Ham merely teaches that the sides of the teeth from the driven gear 18 engage the straight sides of the teeth from the drive gear 16. As known in the art, this curved surface / straight surface type of contact forms a point contact. Therefore, Ham fails to teach or suggest the features of “...*each of the first tooth faces having a first profile including a first and a second **linear contact surface***”, “...*each of the second tooth faces having a second profile including a third and a fourth **linear contact surface***” or “*where the first and the second gears mesh together such that the first linear contact*

*surface... **linearly contacts** the third linear contact surface... along one of a plurality of portions of a linear contact region.”* (cl. 1, emphasis added).

A 35 U.S.C. §102(b) rejection requires a single prior art reference disclose each feature of the claimed invention. As a result, it is respectfully submitted that Ham is incapable of anticipating claim 17.

### **CLAIM 18**

Applicants respectfully submit that claim 18 is patentable for at least similar reasons as set forth above with respect to claim 17.

3. Claim 9 currently stands rejected under 35 U.S.C. §103(a) for allegedly being obvious in view of Ham and U.S. Patent No. 2,760,381 (hereinafter “Pickles”).

Applicants respectfully submit that this rejection is moot since claim 1 is patentable for at least the reasons as set forth above.

For all the foregoing reasons, reconsideration and allowance of claims 1-4, 8, 9 and 12-18 is respectfully requested.

If a telephone interview could assist in the prosecution of this application, please call the undersigned attorney.

Respectfully submitted,



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